

TITLE OF THE INVENTION

**MACHINE AND PROCESS FOR PRODUCING A FIBROUS MATERIAL
WEB**

INVENTORS

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CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] The present application claims priority under 35 U.S.C. § 119 of German Patent Application No. 100 32 251.4, filed on July 3, 2000, the disclosure of which is expressly incorporated by reference herein in its entirety.

BACKGROUND OF THE INVENTION

1. **Field of the Invention**

[0002] The present invention relates to a machine for producing a fibrous material web, in particular a tissue or hygiene paper web, having at least one shoe press including a drying cylinder and one shoe press unit for forming a pressing nip that is elongated in the web travel direction, with the fibrous material web being guided through the elongated pressing nip along with a water-permeable continuous carrying belt and with the carrying belt being guided over at least one suctioned apparatus before the shoe press in the web travel direction.

[0003] The instant invention also relates to a process for producing a fibrous material web, in particular a tissue or hygiene paper in which the fibrous material web, along with a water-permeable continuous carrying belt, is guided through at least one elongated pressing nip of a shoe press including a drying cylinder and a shoe press unit and the carrying belt is guided over at least one suctioned apparatus before the shoe press in the web travel direction.

2. **Discussion of Background Information**

[0004] A machine of the type mentioned at the outset is disclosed in EP-A-0 926 296.

[0005] In a tissue machine known from WO 97 / 03247, a relatively large and expensive TAD (through air drying) unit is provided instead of a shoe press.

SUMMARY OF THE INVENTION

[0006] The present invention provides a device and process of the type mentioned at the outset with which the dry content of the tissue is further increased in a volume-saving and cost-effective manner and, correspondingly, the production of tissue can be made more economical.

[0007] With regard to the machine, the instant invention includes a hood subjected to overpressure that is assigned to the suctioned apparatus in order to support the underpressure effect of the suctioned apparatus.

[0008] Via the hood, which is subjected to overpressure and can be a smaller hood in particular, the underpressure effect of the suctioned apparatus is supported, which improves the runnability of the tissue web, especially at higher speeds. Thus, such a hood can be used particularly advantageously where the speeds are greater than approximately 1800 m/min, preferably greater than approximately 2000 m/min, and in particular greater than approximately 2200 m/min.

[0009] Preferably, the carrying belt is guided over the suctioned apparatus along with the fibrous material web, with the fibrous material web lying on the outside.

[0010] In a preferred practical embodiment of the machine according to the invention, the suctioned apparatus includes a suction roll.

[0011] It is advisable to provide overheated steam and/or dry and/or moist hot air as an overpressure fluid for the hood. The heating of the fibrous material web caused thereby contributes substantially to increasing dewatering performance in the subsequent elongated pressing nip. Here, even an increase in web moisture by the moist hot air can be accepted. Moreover, the steam and the dry hot air also intensify the drying in the region of the suctioned apparatus.

[0012] It is advantageous for an additional suctional element to be provided

between the suctioned apparatus and the shoe press. In this manner, the dry content is increased further because this additional suction element prevents the back flow of the water from the carrying belt into the tissue web caused by capillary action. This suction element can, in particular, include a suction box.

[0013] The shoe press unit advantageously has several pressing zones, at least crosswise to the web travel direction, that are adjustable independently of one another.

[0014] In a useful practical embodiment, the drying cylinder is provided as a tissue or Yankee drying cylinder from which the fibrous material web can be scraped after drying has occurred by a crepe doctor.

[0015] It is advantageous for the carrying belt to be provided in a forming section for accepting the fibrous stock suspension from a headbox.

[0016] Here, it is advisable to guide the carrying belt as the inner belt over a forming roll or the like, over which at least one continuous outer wire is guided.

[0017] In a useful practical embodiment of the machine according to the invention, a felt belt is provided as the carrying belt and/or the inner belt.

[0018] Thus, especially an embodiment as a crescent former with a felt belt provided as an inner wire is possible. The use of an additional suction element arranged between the suctioned apparatus and the shoe press is particularly advantageous in such an arrangement.

[0019] In another useful embodiment, a wire belt, for example, a dewatering belt, is provided as the carrying and/or inner belt. In this case, an additional continuous felt belt arranged between the carrying belt and the shoe press unit is guided along with the fibrous material web and the carrying belt through the elongated pressing nip, whereby markings are prevented and dewatering is supported or even deliberately produced, in particular when the carrying belt is an imprinting wire or felt.

[0020] The shoe press unit is preferably provided with a water-impermeable circulating endless pressing belt. Here, the shoe press unit can, in particular, be formed by a shoe press roll with a pressing jacket, preferably a water-impermeable pressing jacket.

[0021] Otherwise, the shoe press can, in particular, be embodied as described in DE-A-99 125 789.0, the disclosure of which is expressly incorporated by reference herein in its entirety.

[0022] The process according to the invention is correspondingly characterized in that the underpressure effect of the suctioned apparatus is supported by an overpressurized hood that is assigned to one of the suctioned apparatuses.

[0023] The arrangement and process according to the invention can be used in particular in tissue machines of various embodiments, for example, for suction breast roll formers, double wire formers, crescent formers, fourdrinier wires, etc. Moreover, a combination with through air drying concepts is advantageous.

[0024] The present invention is directed to a machine for producing a fibrous material web that includes at least one shoe press having at least one drying cylinder and a shoe press unit which are arranged to form a pressing nip elongated in a web travel direction. At least one suctioned apparatus is arranged before the at least one shoe press relative to the web travel direction, and a water-permeable continuous carrying belt is arranged to guide the fibrous material web over the at least one suctioned apparatus and through the elongated pressing nip. A hood subjected to an overpressure is assigned to the suctioned apparatus and is arranged to support an underpressure effect of the at least one suctioned apparatus.

[0025] In accordance with a feature of the instant invention, the fibrous material web can include a tissue or hygiene paper web.

[0026] According to another feature of the invention, as the carrying belt

guides the fibrous material web over the suctioned apparatus, the carrying belt can be arranged between the fibrous material web and the suctioned apparatus.

[0027] The present invention also provides that the suctioned apparatus may include a suction roll.

[0028] The hood can contain an overpressure fluid comprising at least one of overheated steam and dry and/or moist hot air.

[0029] Further, a suction element can be positioned between the suctioned apparatus and the at least one shoe press. The suction element can include a suction box.

[0030] The at least one shoe press unit may include a plurality of pressing zones arranged crosswise to the web travel direction. Further, the plurality of pressing zones may be controllable independently of one another.

[0031] Moreover, the drying cylinder can include a tissue or Yankee drying cylinder, and the machine further may further include a crepe doctor arranged to remove the fibrous material web from the tissue or Yankee drying cylinder after drying.

[0032] In accordance with still another feature of the instant invention, the machine may include a forming section in which the carrying belt can be arranged to accept a fibrous stock suspension from a headbox.

[0033] Still further, a forming roll and a continuous outer wire may be provided. The carrier belt can also guided over the forming roll as an inner belt over a forming roll in relation to the continuous outer wire. Further, the inner belt may include a felt belt, a wire belt, a dewatering belt, or an imprinting member.

[0034] According to a still further feature of the present invention, the carrier belt can include a felt belt, a wire belt, a dewatering belt, or an imprinting member.

[0035] The machine in accordance the instant invention can further include an

additional continuous felt belt which is arranged between the carrying belt and the shoe press unit and which is guided through the elongated pressing nip along with the fibrous material web and the carrying belt.

[0036] The one shoe press unit may include a water-impermeable continuous, circulating press belt.

[0037] Moreover, the shoe press unit can include a shoe press roll with a pressing jacket. The pressing jacket may include a water-impermeable pressing jacket.

[0038] The present invention is directed to a process for producing a fibrous material web in an apparatus including a water-permeable continuous carrying belt, at least one shoe press having an elongated pressing nip formed between a drying cylinder and a shoe press unit, at least one suctioned apparatus, which includes a hood, arranged before the at least one shoe press unit relative to a web travel direction, and a carrying belt guided over the at least one suctioned apparatus. The process includes guiding the fibrous material web and the carrying belt through the elongated pressing nip, and supporting an underpressure effect of the suctioned apparatus by creating an overpressure in the hood.

[0039] According to a feature of the instant invention, as the carrying belt guides the fibrous material web over the suctioned apparatus, the carrying belt can be positioned between the suctioned apparatus and the fibrous material web.

[0040] In accordance with another feature of the present invention, the suctioned apparatus may include a suction roll.

[0041] According to the process of the invention, the overpressure in the hood can be created by an overpressure fluid comprising at least one of overheated steam and dry and/or moist hot air.

[0042] Moreover, the apparatus can further include a suction element

positioned between the suctioned apparatus and the at least one shoe press, and process may further include suctioning the carrying belt and fibrous material web guided over the suction element.

[0043] In accordance with still another feature of the present invention, the suction element may include a suction box.

[0044] Further, the shoe press unit can include a plurality of pressing zones arranged at least crosswise to the web travel direction, and the process may further include independently controlling the plurality of pressing zones.

[0045] The drying cylinder can include a tissue or Yankee drying cylinder, and the process may include scraping the fibrous material web from the tissue or Yankee drying cylinder after drying. Further, the apparatus can include a crepe doctor and the process may further include scraping the fibrous material web from the tissue or Yankee drying cylinder after drying with the crepe doctor.

[0046] In accordance with a further feature of the invention, the apparatus can include a forming section and the carrying belt can be guided through the forming section, and the process may include accepting a fibrous material suspension from a headbox on the carrying belt.

[0047] Still further, the apparatus may include a forming roll with a continuously outer wire, and the carrying belt may be guided over the forming roll as an inner wire between the continuous outer wire and the forming roll, and the process can include supplying a fibrous material suspension between the inner wire and the outer wire. Further, the inner belt may include a felt belt, a wire belt, a dewatering belt, or an imprinting member.

[0048] Further, in the process of the instant invention, the carrier belt may include a felt belt, a wire belt, a dewatering belt, or an imprinting member.

[0049] The apparatus can include an additional continuous felt belt arranged

between the carrying belt and the shoe press unit in the elongated pressing nip, and the process may include guiding the fibrous material web through the elongated pressing nip along with the carrying belt and the additional continuous felt belt.

[0050] According to the process of instant invention, the shoe press unit can include a water-impermeable pressing belt.

[0051] In accordance with a feature of the process of the present invention, the shoe press unit can include a pressing jacket. Further, the pressing jacket may include a water-impermeable pressing jacket.

[0052] The present invention is directed to an apparatus for producing a fibrous material web that includes at least one shoe press including at least one drying cylinder and a shoe press unit which are arranged to form a pressing nip elongated in a web travel direction. At least one suctioned apparatus is arranged before the at least one shoe press relative to the web travel direction, and an overpressure device is associated with the at least one suctioned apparatus arranged to support an underpressure effect of the at least one suctioned apparatus.

[0053] According to a feature of the instant invention, the overpressure device may include a hood subjected to an overpressure, which can be arranged to surround at least a portion of the at least one suctioned apparatus.

[0054] In accordance with yet another feature of the present invention, the overpressure device can include an overpressure fluid comprising at least one of overheated steam and dry and/or moist hot air.

[0055] The present invention is directed to a process for producing a fibrous material web in an apparatus that includes at least one shoe press having at least one drying cylinder and a shoe press unit which are arranged to form a pressing nip elongated in a web travel direction, at least one suctioned apparatus arranged before the at least one shoe press relative to the web travel direction, and an overpressure

device associated with the at least one suctioned apparatus. The process includes guiding the fibrous material web over the at least one suctioned apparatus, and subjecting the fibrous material web to an overpressure while is it guided over the at least one suctioned apparatus.

[0056] Other exemplary embodiments and advantages of the present invention may be ascertained by reviewing the present disclosure and the accompanying drawing.

BRIEF DESCRIPTION OF THE DRAWINGS

[0057] The present invention is further described in the detailed description which follows, in reference to the noted plurality of drawings by way of non-limiting examples of exemplary embodiments of the present invention, in which like reference numerals represent similar parts throughout the several views of the drawings, and wherein:

[0058] Figure 1 illustrates a schematic partial depiction of a machine for producing a tissue or hygiene paper web that is embodied as a crescent former and provided with an inner felt belt; and

[0059] Figure 2 illustrates a schematic partial depiction of a machine for producing a tissue or hygiene paper web that is provided with an inner wire.

DETAILED DESCRIPTION OF THE PRESENT INVENTION

[0060] The particulars shown herein are by way of example and for purposes of illustrative discussion of the embodiments of the present invention only and are presented in the cause of providing what is believed to be the most useful and readily understood description of the principles and conceptual aspects of the present invention. In this regard, no attempt is made to show structural details of the present invention in more detail than is necessary for the fundamental understanding of the present invention, the description taken with the drawings making apparent to those

skilled in the art how the several forms of the present invention may be embodied in practice.

[0061] Figure 1 shows in a schematic partial view a machine 10 embodied as a crescent former for producing a fibrous material web 12, which can be, in particular, a tissue or hygiene paper web.

[0062] Here, a continuous inner or carrying belt 16 and a continuous outer wire 18 are guided together over a region of a so-called forming roll 14. As can be seen in Figure 1, the wrapping angle with regard to outer wire 18 is less than the wrapping angle with regard to carrying belt 16 located to the inside.

[0063] In inlet nip 20 formed between carrying belt 16 and outer wire 18, the fibrous stock suspension is added by a headbox 22. After the wrapping region of forming roll 14, fibrous material web 12 being formed is guided along with carrying belt 16 to a pressing nip 24 elongated in a web travel direction L.

[0064] Before reaching elongated pressing nip 24, carrying belt 16 guiding fibrous material web 12 wraps a suctioned apparatus, embodied here as a suction roll 26. Suction roll 26 removes a substantial portion of the water from carrying belt 16 and possibly removes some from outlying fibrous material web 12 as well.

[0065] In the present exemplary embodiment, carrying belt 16 is provided as a felt belt.

[0066] Via suction roll 26, the water absorption capabilities of carrying belt 16 are increased so that, in the subsequent elongated pressing nip 24 through which it travels along with fibrous material web 12, it can absorb the water that is pressed out.

[0067] The underpressure effect of suction roll 26 is supported by a hood 28 that is subjected to overpressure and assigned to suction roll 26. As a rule, a small hood is sufficient in this case. In the present case, carrying belt 16 is guided over suction roll 26 with fibrous material web 12 facing outwards.

[0068] Overheated steam and/or dry and/or moist hot air is provided as the overpressure fluid for hood 28.

[0069] Through this arrangement, the dewatering is intensified in such a way that it is sufficient to use only one pressing nip 24.

[0070] Shoe press 30 forming elongated pressing nip 24 includes a drying cylinder 32 serving as a tissue or Yankee drying cylinder and a shoe press unit 34 with at least one press shoe 36 and a continuous circulating press belt 38 guided over them. In the present case, shoe press unit 34 is formed by a shoe press roll with a flexible, preferably water-impermeable, pressing jacket 38.

[0071] Press shoe 36 has a pressing surface 40 that is at least essentially concave. The pressing can occur hydraulically, for example. The region between flexible pressing jacket 38 and press shoe 36 can be lubricated, in particular hydrostatically or hydrodynamically.

[0072] Shoe pressing unit 34 preferably has several pressing zones crosswise to the web travel direction L that can be controlled independently of one another, which allows an adaptation to the sagging of drying cylinder 32 as well as the setting of a desired pressing pressure profile crosswise to the web travel direction L.

[0073] Pressing nip 24 running in the web travel direction L allows an intense and yet volume-saving dewatering of fibrous material web 12.

[0074] After elongated pressing nip 24, fibrous material web 12 runs along heated drying cylinder 32. The drying is further intensified in this wrapping region by a drying hood 42, which blows the hot, dry air onto fibrous material web 12 and suctions it off again.

[0075] After drying has occurred, fibrous material web 12 is removed from drying cylinder 32 by a crepe doctor 44. Creped fibrous material web 12 can subsequently be further processed and wound.

[0076] In the present case, an additional suction element is provided between suction roll 26 and shoe press 30; this suction element can be formed, for example, by a suction box 46 or the like. By this additional suction box 46, the dry content is further increased because the back flow of the water from carrying belt 16 into fibrous material web 12 caused by capillary action is prevented.

[0077] Figure 2 shows a schematic partial view of another exemplary embodiment of a machine 10 for producing a fibrous material web 12, which again can particularly be a tissue or hygiene paper web.

[0078] This embodiment differs from that of Figure 1 initially in that a wire belt, for example, a dewatering belt, is provided instead of a felt belt as the carrying and/or inner belt 16. In this case, an additional continuous felt belt 48 arranged between carrying belt 16 and shoe press unit 34 is fed through elongated pressing nip 24 along with fibrous material web 12 and carrying belt 16 for the purpose of preventing markings and supporting or even deliberately producing dewatering, in particular when the carrying belt is an imprinting wire or felt.

[0079] Additional suction element 46 provided between suction roll 26 and shoe press 30 in the embodiment according to Figure 1 is omitted in the present case.

[0080] Otherwise, the embodiment shown in Figure 2 has at least essentially the same construction as that of Figure 1. Corresponding parts have been given the same reference characters.

[0081] It is noted that the foregoing examples have been provided merely for the purpose of explanation and are in no way to be construed as limiting of the present invention. While the present invention has been described with reference to an exemplary embodiment, it is understood that the words which have been used herein are words of description and illustration, rather than words of limitation. Changes may be made, within the purview of the appended claims, as presently stated and as

amended, without departing from the scope and spirit of the present invention in its aspects. Although the present invention has been described herein with reference to particular means, materials and embodiments, the present invention is not intended to be limited to the particulars disclosed herein; rather, the present invention extends to all functionally equivalent structures, methods and uses, such as are within the scope of the appended claims.

LIST OF REFERENCE CHARACTERS

10	Machine
12	Fibrous material web
14	Forming roll
16	Continuous inner or carrying belt
18	Continuous outer wire
20	Inlet nip
22	Headbox
24	Elongated pressing nip
26	Suction roll
28	Overpressure hood
30	Shoe press
32	Drying cylinder
34	Shoe press unit
36	Pressing shoe
38	Pressing jacket
40	Concave pressing surface
42	Drying hood
44	Crepe doctor
46	Suction box
48	Felt belt
L	Web travel direction